

Original Research Article

Study of oxidative stress in patients of psoriasis

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ABSTRACT

Background: Psoriasis is a well-recognized chronic inflammatory papulosquamous disorder characterized by the formation of salmon colored papules and plaques with silvery white scales. The aim of this study was to do a comparative evaluation of the parameters of oxidative stress, namely glutathione peroxidase, malondialdehyde and superoxide dismutase in patients of psoriasis with normal healthy subjects

Methods: 60 subjects in the age group of 30-70 years were included in the study; Group A consisted of 30 newly diagnosed psoriasis patients presenting to the Dermatology OPD and Group B consisted of 30 normal healthy individuals. Thorough history taking and clinical examination were done. The punch biopsy was performed for histopathological examination and markers of oxidative stress were measured in each case and these values were then compared to healthy controls and statistical analysis was performed.

Results: On comparison of the two groups, the levels of anti-oxidants superoxide dismutase and glutathione peroxidase were found to be decreased in psoriasis patients (168.46 ± 51.89 U/ml and 4121.63 ± 1812.53 U/ml respectively) as compared to controls (237 ± 39.30 U/ml and 8435 ± 1397.54 U/ml respectively) which was statistically highly significant ($p < 0.001$) and the level of pro-oxidant malondialdehyde was found to be increased in patients of psoriasis (0.42 ± 0.13 nmol/ml) in contrast to controls (0.08 ± 0.06 nmol/ml) which was also statistically highly significant ($p < 0.001$).

Conclusions: Keeping in consideration the increased oxidative stress in the patients of psoriasis, the anti-oxidant drugs can form an important part of the therapeutic ladder of psoriasis.

Keywords: Psoriasis, Oxidative stress, Malondialdehyde, Superoxide dismutase, Glutathione peroxidase

INTRODUCTION

Psoriasis is a disorder of abnormal keratinization characterized by exaggerated and disordered epidermal cell proliferation with Th1 inflammation playing a central role in its pathogenesis.^{1,2} It affects 1-3% of the general population.³

It can present with myriad of cutaneous manifestations but most commonly the disease presents as chronic, symmetrical, erythematous, papules and plaques with silvery white scales. The lesions are usually bilaterally

symmetrical with typical distribution on the scalp, elbows, knees and lumbosacral area.^{4,5}

Various studies over the years have implicated the role of increased oxidative stress in the pathogenesis of psoriasis. When the oxidative stress overwhelms the anti-oxidant capacity of the skin, it leads to an alteration of cellular homeostasis which alters the phenotype creating a microenvironment conducive to the development of disease processes.⁶ There is increase in malondialdehyde (MDA) which is an end product of lipid peroxidation and acts as a pro-oxidant causing increase in oxidative burden of psoriatic skin.⁷ On the other hand, certain enzymes

form an important line of defence, including glutathione peroxidase (GP), superoxide dismutase (SOD) and catalase (CAT) which decrease the concentration of the most harmful oxidants.^{8,9}

METHODS

The present study was undertaken in the department of dermatology in collaboration with the department of biochemistry at Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar. 60 subjects were included in the study, which were divided into two groups: Group A consisted of 30 subjects of psoriasis while group B had 30 healthy age and sex matched individuals from the general population without any previous history of psoriasis. The selection criteria for patients of Group A was those having biopsy proven chronic plaque type psoriasis (involving more than 10% of body surface area) showing exacerbation of psoriasis during last 3 months in the age group of 30-70 years. Proforma were duly filled and written consent was taken in all the cases. Thorough history was taken and complete clinico-histopathological examination was performed.

Exclusion criteria

Pregnant women, patients with other risk factors for oxidative stress such as AIDS, tuberculosis, smoking and alcohol consumption, Patients with hepatic or renal diseases, psoriatic arthritis, gout, rheumatoid arthritis and on antioxidant supplements

Investigations

Skin biopsy was done in subjects of Group A using 5 mm punch under local anesthesia and specimen was sent for histopathological examination.

Fasting blood samples were collected from all the 60 subjects. Serum SOD levels were measured by Marklund and Marklund method, 1974 modified by Nandi and Chatterjee, 1988.^{10,11}

Serum GP estimation was done by continuous spectrophotometric rate determination and serum MDA levels were measured by the method described by Satoh, 1988.^{12,13} After performing these tests, the data was analysed statistically by one way ANOVA with Post Hoc Tukey comparing mean values of all the variables between the two groups. The values were considered significant if the p value was <0.05 and highly significant if the p value was <0.001. SPSS 17.0 software was used.

RESULTS

In the Group A, there were 14 (46.7%) females and 16 (53.3%) males in the age group of 30-70 years with the mean body surface area involved being 23.7% and in the Group B, there were 17 (56.7%) females and 13 (43.3%) males in the same age group. In Group A, scalp

involvement was present in 70% (21) patients, face was involved in 6.7% (2), upper limbs in 86.7% (26), elbows in 63.3% (19), trunk in 96.7% (29), knees in 60% (18), lower limbs in 73.3% (22), palms in 6.7% (2) and soles in 6.7% (2). Scaling was present in 93.3% (28) of the patients.

Comparison of the groups has been done in Table 1 and Figures 1-3, which shows increased oxidative stress in patients of psoriasis when compared to healthy controls. There is increase in marker of oxidative stress in psoriasis i.e. MDA (p <0.001) whereas there is decrease in anti-oxidants i.e. SOD (p <0.001) and GP (p <0.001).

Table 1: Parameters of oxidative stress in both groups.

Parameters	Group A Mean±SD	Group B Mean±SD	P value
SOD (U/ml)	168.46±51.89	237±39.30	<0.001 ***
GP (U/ml)	4121.63±1812.53	8435±1397.54	<0.001 ***
MDA (nmol/m)	0.42±0.13	0.08±0.06	<0.001 ***

P value >0.05-insignificant*; P <0.05- significant**; P <0.001 - highly significant***

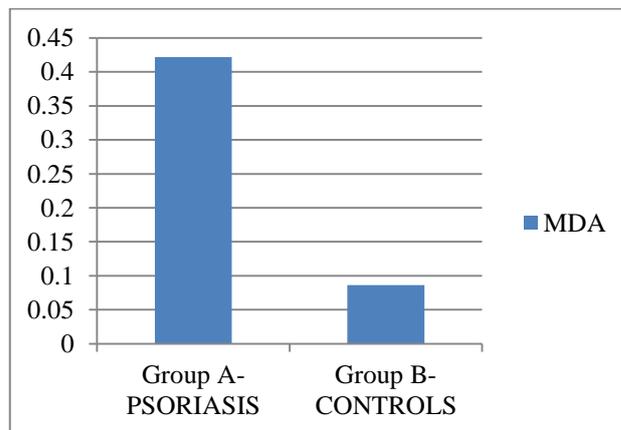


Figure 1: Comparison of MDA in both groups.

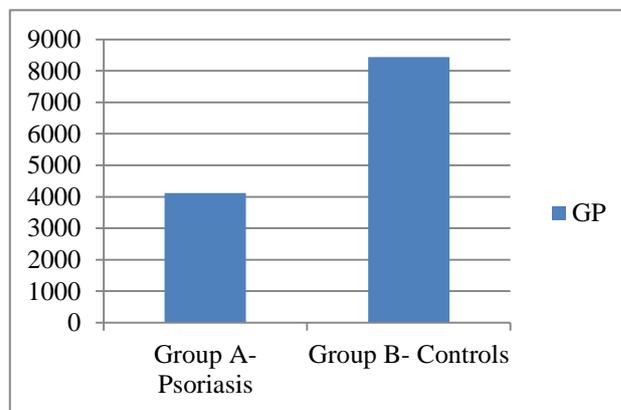


Figure 2: Comparison of GP in both groups.

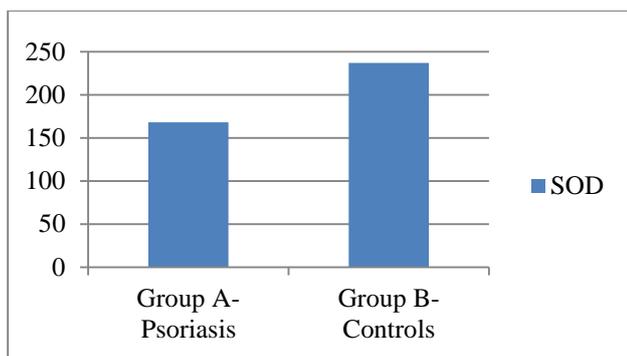


Figure 3: Comparison of SOD in both groups.

DISCUSSION

Skin is a potential target for oxidative injury, as it is continuously being exposed to UV radiation and other environmental stress generating highly reactive oxygen species (ROS).¹⁴ A free radical is defined as any species that contains at least one unpaired electron which exists for a brief period of time owing to its highly reactive nature. The radical derivatives of oxygen being the most important free radicals in biological systems.¹⁵

Antioxidants consist of a system of enzymes, including GP, SOD and CAT. They decrease the concentration of harmful oxidants and help in maintaining equilibrium between the production and destruction of the ROS in the body. In patients of psoriasis, imbalance is seen in this equilibrium which may manifest as either excessive production of ROS or decrease in anti-oxidants which are required for counter-acting their action.⁸

Our study showed that the levels of protective antioxidant glutathione peroxidase are decreased in patients of psoriasis, our results are in accordance with the study done by Wozniak et al, in which they found that the mean level of glutathione peroxidase in psoriasis patients were decreased as compared to healthy individuals.¹⁶

In our study, the levels of superoxide dismutase were increased whereas while MDA levels were increased in group A patients. A study done by Drewna et al, showed that SOD was 20% lower and MDA was 44% higher in patients of psoriasis as compared to controls.¹⁷ These findings are consistent with our study.

The results of the study done by Kadam, et al were also similar to our study which showed that serum MDA levels were significantly increased in psoriasis patients ($p < 0.01$) as compared to healthy controls. Furthermore, they found severity wise increase in MDA levels in these patients indicating that the degree of elevation of serum MDA is associated with the progression of psoriasis.¹⁸ Another study done by Bacchetti et al, showed that total oxidant stress is increased in patients of psoriasis.¹⁹

CONCLUSION

Our study provides an important evidence of considerable increase in the oxidative stress in patients of psoriasis when compared to healthy individuals. Therefore, attenuation of oxidative stress might be a relevant therapeutic approach in these patients and it can form an important part of futuristic and holistic management of psoriasis.

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